Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Progress Toward a Three-Node Multispecies Ion Trap Quantum Network[1] ALLISON CARTER, KSENIA SOSNOVA, GEORGE TOH, JAMESON O'REILLY, CHRISTOPHER MONROE, Joint Quantum Institute, University of Maryland, College Park — To address the challenge of scaling trapped ion quantum computing systems, we utilize a modular architecture consisting of separate traps, each containing $^{171}Yb^{+}$ memory qubits and $^{138}Ba^{+}$ communication qubits. Single photons from the Ba^{+} ions provide links between nodes of the network for remote entanglement. The main challenge in this system is achieving high remote entanglement generation rates. Here we present the design of and progress toward construction of a three-node network with increased modularity and nearly quadrupled potential photon collection rates. In particular, we focus on the design and testing of in-vacuum high numerical aperture (NA=0.8) aspheric lenses as replacements for our current NA=0.6 multi-component objective. Additionally, we discuss a protocol for generating full remote entanglement among three traps utilizing both atomic species.

[1]This work is supported by the ARO with funding from the IARPA LogiQ program, the AFOSR, the ARO MURI on Modular Quantum Circuits, the AFOSR MURI on Quantum Transduction, the AFOSR MURI on Interactive Quantum Computation and Communication Protocols, and the ARL Center for Distributed Quantum Information.

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Date submitted: 30 Jan 2020 Electronic form version 1.4